BIOLOGICAL EVALUATION
PINE BUTTERFLY INFESTATIONS
Payette National Forest
Idaho 1972

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The pine butterfly is a known primary defoliator of ponderosa pine in northwestern United States. Populations develop into destructive tree killing numbers periodically. Outbreaks may take place over comparatively large areas causing subsequent concernful mortalities of mature and overmature trees. Information on major historical outbreaks of economic importance, life history, natural and chemical control were covered by Cole (2)(3)(4) and Orr (5).

The objective of this evaluation was to determine the immediate trend of the upsurge of pine butterfly infestations that became epidemic on the Payette National Forest the past season. This was accomplished by correlating results of egg surveys with observed defoliation.

Region 1 entomologists have been concerned with a pine butterfly epidemic that has been causing serious defoliation on the Nezperce National Forest the past two years. These infestations which lie north of the Salmon River east of Riggins are adjacent to ponderosa pine stands on the Payette National Forest. As the epidemic on the Nezperce has increased, coincidental increases of adult butterfly sightings have been received in areas south of the Salmon River. During aerial surveys in 1971, particularly heavy flights of butterflies were seen from Warm Springs Creek to Studebaker Saddle. Even though flights of adults were conspicuous, defoliation was not detected from the air that year.

A limited egg survey in the fall of 1971 in two areas did show, however, a high rate of egg deposition on ponderosa pine needles in the Studebaker Saddle Area. Standards of egg count measurements for prediction purposes developed by Cole showed an expected heavy defoliation in that area in 1972. That prediction was correct.

GENERAL INFORMATION

Insect - Pine butterfly, *Neophasia menapia* (Felder and Felder).

Host Tree - Ponderosa pine, *Pinus ponderosa* Laws.

Location - An aerial survey in 1972 disclosed some twenty areas of visible defoliation for the first time on the Forest and adjacent Bureau of Land Management, State, and private lands. These areas occurred mainly on higher ridges and slopes south of the Salmon River. The defoliated areas extend south of Riggins Hot Springs east to Big Bear Creek in the Idaho Primitive Area.

Type of Damage - Defoliation of mature trees with subsequent possible tree killing and/or predisposition to bark beetle attacks.

Extent of Infestation - Approximate acreages involved and defoliation intensity are shown on the appended map. About 4,400 acres showed heavy foliage loss on part or all of 12 areas. Moderate defoliation covered about 2,440 acres on part or all of six of the areas. Two of the areas showed defoliation grading from moderate to heavy.

SAMPLING PROCEDURES

The infestation was flown and mapped during the course of the annual aerial detection flight in August. An egg survey was conducted on the ground using the aerial detection maps as a guide to defoliated areas. An attempt was made to sample eggs as close to remote areas of observed defoliation as possible. Since adult butterflies had been observed almost everywhere in the ponderosa pine type, sampling points were established at widely scattered locations in an attempt to locate areas of concentration.

Samples were obtained from fourteen locations, see map, in September and October. Defoliation potential for 1973 was determined partly from resultant viable egg counts. Effect of natural control factors on egg populations was determined by comparing viable with non-viable eggs. Presumably non-viable eggs had been emptied of their contents by insect predators and only the grayish egg shells remained.

Region 1 entomologists have developed a linear regression equation for analyzing egg counts for defoliation predictions, Bousfield and Ciesla (1). Their work showed a high correlation between egg deposition rates and percent of trees showing defoliation.* Their system of cluster-sampling foliage in the field was adopted for our purposes. A single unit of foliage consists of the apical 5 inches of a branch. Six of these apical twigs are cut with a pole pruner from around the mid-crown circumference of each tree. Ten trees are sampled in this manner, at random, from each location and the completed cluster-sample of foliage contains 60 twigs.

*Jerald Dewey, Entomologist, Region 1, analyzed the Payette egg survey data using a statistical model developed by Region 1 personnel.

BIOLOGICAL INFORMATION

The pine butterfly overwinters in the egg stage. The adult lays its eggs in rows securely cemented to the current year's needles. Eggs are easily seen with the unaided eye and viable eggs are an emerald green color. The old growth needles are eaten in the spring by newly hatched larvae and the new needles are usually left, although under epidemic conditions these too may be eaten. Heavily defoliated trees show a decided thinned appearance and only "tufts" of new needles are left.

DISCUSSION

From the regression equation two of fourteen locations sampled for eggs are expected to incur moderate to heavy defoliation in 1973; Fall Creek and Studebaker Saddle, Table 1. Expected defoliation for 1973 coincides with heavy visible defoliation that was seen from the air in 1972 in or near these two areas. From this, we may conclude that continued moderate to heavy defoliation is likely to occur again in 1973 in or near other areas mapped that showed heavy needle loss in 1972. Locations of visibly defoliated trees that occurred outside the Idaho Primitive Area are Warm Springs Creek, Partridge Creek (4 areas), lower Elkhorn Creek, Long Tom Creek, Bear Creek, Maxwell Creek, and Rooster Creek. Visible defoliation inside the Primitive Area was mapped on Little Fivemile Creek, Lemhi Creek, Hot Springs Creek, Arctic Creek, and Big Bear Creek.

Ten additional widely scattered locations, where butterfly egg samples were taken, showed egg deposition in relatively low numbers. Only light feeding is expected in these areas. At two locations, Brown's Pond and Mud Creek, foliage samples contained no butterfly eggs.

Studebaker Saddle had next to the highest number of total eggs and the highest natural predation of the egg population with 30 percent egg loss, Table 2. Fall Creek had the highest number of total eggs and third highest egg reduction from predation. Split Creek may not show visible defoliation in 1973, due primarily to relatively low egg numbers and a 21 percent egg predation. Six of fourteen areas sampled for eggs showed some predation whereas eight showed none. Beneficial insect predators discussed by Cole were a pentatomid (stink bug) and a species of Raphidia (snakeflies). Stink bugs were observed on pine foliage in the K Creek Area.

Ponderosa pine in the mature to overmature age classes are those most susceptible to damage from needle loss caused by the pine butterfly. Damage is in the form of reduced growth increment and mortality. Weakened trees may become susceptible to bark beetles. Early reports indicate that outbreaks last two to five years, when they are controlled by natural enemies. In addition to predators mentioned a parasitic wasp, Theronia atalantae (Poda), has in itself been largely responsible for controlling epidemics in the past according to several workers. This ichneumonid is a pupal parasite. A sarcophagid (parasitic fly), Agria affinis (Fall), is another parasite reported by Orr and Cole that destroyed large numbers of pine butterfly pupae in August of 1952 and 1953. This occurred during an epidemic on the Boise National Forest that ended after a chemical control program in 1954.

RECOMMENDATIONS

No control action is recommended at this time. It is understood that most of the infested areas on Forest land are not only remote from roads but will not or cannot be logged due to inoperability and consideration of other resource values. One exception is the Studebaker timber sale that will extend from Fall Creek drainage to Studebaker Saddle. High pine butterfly defoliation potential is indicated for 1973 from our surveys within the sale boundary. The sale is timely considering the possibility of tree mortality from increasing butterfly populations, which would be avoided in whole or in part through logging.

An extensive evaluation of the pine butterfly is planned for 1973. Predation, parasitism, virus disease, and other natural control factors will be assessed. Foliage samples for egg counts and an aerial survey are planned to determine trend and to delineate any change in the extent and intensity of damage. Specific tree losses will be looked for in twice defoliated areas and evidence of trees becoming susceptible to bark beetles.

Table 1. INFESTATION TREND OF PINE BUTTERFLY ON THE PAYETTE NATIONAL FOREST

Location	Number viable eggs/5 in. twig	Defoliation[a/] expected in 1973
Krassel Airport	0.18	0
Lake Creek	0.45	0
Sayer	0.48	0
Silver Creek	0.53	0
Bear Basin	1.10	0
Brown's Pond	0.0	0
Mud Creek	0.0	0
Camp Creek	0.22	0
Split Creek	4.82	0
K Creek	2.54	0
Studebaker Saddle	25.45	30
Fall Creek	49.7	62
Railroad Saddle	0.27	0
Denny Creek	6.67	0

a/ Percent of trees with visible defoliation.

Table 2. PINE BUTTERFLY EGG PREDATION
PAYETTE NATIONAL FOREST
1972

Location	Number eggs/5 inch twig		Percent Predation
	Total eggs	Viable eggs	
Krassel Airport	0.18	0.18	0
Lake Creek	0.45	0.45	0
Sayer	0.50	0.48	4
Silver Creek	0.58	0.53	9
Bear Basin	1.10	1.10	0
Brown's Pond	0.0	0.0	0
Mud Creek	0.0	0.0	0
Camp Creek	0.22	0.22	0
Split Creek	6.12	4.82	21
K Creek	2.64	2.54	4
Studebaker Saddle	36.22	25.45	30
Fall Creek	56.02	49.70	11
Railroad Saddle	0.27	0.27	0
Denny Creek	6.67	6.67	0

Prepared by:

Arland C. Valcarce

Arland C. Valcarce, Entomologist
Branch of Forest Pest Control

Recommended by:

A. M. Rivas

A. M. Rivas
Branch of Forest Pest Control

Approved by:

Marlin C. Galbraith

Marlin C. Galbraith
Assistant Regional Forester

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